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THE INFLUENCE OF PERSONALITY DISORDER ON THE FUTURE MENTAL HEALTH AND SOCIAL ADJUSTMENT OF YOUNG ADULTS: A POPULATION-BASED COHORT STUDY

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ABSTRACT

Background

Existing knowledge about the consequences of personality disorders (PD) is substantially derived from the study of clinical populations. This paper reports findings from a large, population-based, longitudinal study of the long-term mental health and social consequences of PD.

Methods

Community-based, longitudinal study of a stratified random sample of 1635 non-treatment seeking young adults recruited from Victoria, Australia. Presence and severity of PD was assessed at age 24 years, using a semi-structured, informant-based interview (the Standardised Assessment of Personality). Psychosocial outcomes were assessed at age 35 years.

Outcomes

At age 24 years, 28% (n=458) of the sample had either personality difficulties or PD. The severity of PD was associated with absence of a degree or vocational qualification, the presence of common mental disorders and cigarette smoking. At age 35 years, PD severity was independently associated with not being in a relationship (adjusted odds ratio (aOR) for the effect of complex and severe PD vs. no PD or personality difficulty: 2.05, 95% CI: 1.21-3.45), increased odds of an anxiety disorder (aOR: 2.27, 95% CI: 1.20-4.28) and major depression (aOR: 2.23, 95% CI: 1.24-4.01).

Interpretation

The presence of PD predicts the occurrence of later anxiety and depression, as well as the absence of long-term relationships, effects that are not attributable to pre-existing common mental disorder. The study provides strong support for including PD in global studies of the burden of mental disorders.

Funding

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INTRODUCTION

Epidemiological research has confirmed that personality disorders are common mental disorders¹ associated with a wide range of difficulties, including alcohol and drug problems², poorer general health³, long-term unemployment⁴ and reduced life expectancy⁵. Despite this literature, policy-informing initiatives such as the Global Burden of Disease have not included PD within their scope⁶. This may have occurred because the wide range of co-occurring problems among people with PD makes it difficult to judge whether there are independent health effects of PD. Examining this issue requires careful prospective enquiry, although longitudinal data in the field are rare and derive mainly from studies of treatment-seeking populations, focussing on a selection of PD subtypes^{7,8}. Although influential in their field, the generalizability of findings from these studies to the general population is unclear. In the current study, using a large non-treatment-seeking sample of young adults, we report the long-term influence of PD on mental health and social functioning. Given the growing interest in classifying PD into levels of pathology based on severity⁹, we examined the influence of PD severity on a range of prospective outcomes.

METHODS

Between August 1992 and September 2013 we conducted a 10-wave cohort study of health in young people in the state of Victoria, Australia. The Ethics in Human Research Committee of the Royal Children's Hospital, Melbourne approved all data collection protocols. Informed written parental consent at study inception was obtained before inviting students to participate; consent from the adolescents was implied by their voluntary participation in the self-administered interviews. Adults gave informed consent prior to participation in each adult wave. The sample was originally recruited in adolescence, although the data reported in this study relate to the adult phase of the study, when PD was first assessed. At baseline, a representative sample of adolescents was selected with a two-stage cluster sampling procedure.

At stage 1, 45 secondary schools were randomly selected from a stratified sampling frame and at stage 2, a single intact class was randomly selected from each participating school (wave 1). School retention rates to year nine in the year of sampling were 98%. A second class from each participating school entered the cohort six months later (wave 2). Participants were subsequently reviewed at four six-month intervals during the teens (waves 3 to 6) with four follow-up waves in adulthood aged 20-21 years (wave 7), 24-25 years (wave 8), 28-29 years (wave 9) and 34-35 years (wave 10). Appendix figure 1 displays the flow of participants through the study.

This report concerns analysis of data collected in waves 8 and 10, which were undertaken using computer-assisted telephone interviews. During the adolescent phase of the study 1943 people participated at least once in waves 1-6 from an intended sample of 2032. Participation at waves 8 and 10 and the analysis samples are displayed in Figure 1.

Exposure measures at 24 years (wave 8)

Personality disorder (PD)

The presence of PD was assessed using the Standardised Assessment of Personality (SAP)¹⁰. The SAP is a semi-structured interview conducted with an informant, either face-to-face or by telephone. It has good reliability¹¹ and has been used in a number of international studies. All wave 8 participants were asked to nominate a friend with whom a telephone interview could be conducted, in order to assess the participant for the presence of PD. If the nominated friend was unavailable/non-contactable, participants were reapproached and asked to nominate an alternative person. Severity of PD was determined by the Tyrer & Johnson method¹² in which five levels were identified; (0) no personality disturbance, (1) personality difficulty (one criterion less than the threshold for PD), (2) simple PD (in one DSM cluster only), (3) complex PD (2+ personality disorders in >1 cluster) and (4) severe PD (2+ PD categories in >1 DSM cluster with one being antisocial PD). In order to retain sufficient statistical power in

multivariable analyses, the last two categories were combined into a single category defined as complex/severe PD.

Background factors included gender and parental divorce or separation during adolescence (by wave 6).

Receipt of government welfare was identified in participants receiving welfare payments because of adverse circumstances.

Post school qualifications. Participants who did not report having obtained a degree or a vocational qualification after leaving school were coded as having ‘*no post school qualification*’.

Common mental disorders. Symptoms of depression and anxiety were assessed with the 12-item General Health Questionnaire (GHQ-12) dichotomised at the cut-off point of ≥ 2 ¹³.

Alcohol use was assessed using a beverage- and quantity-specific four-day diary including all weekend days (Friday to Sunday) and the most recent weekday. We calculated the number of standard drinks (1 unit=10g of alcohol) consumed each day of the diary. High -risk alcohol use was defined as ≥ 5 standard drinks on at least one day of the diary week.

Daily cigarette smoking was recorded in participants who reported smoking on 6-7 days in the week prior to survey.

Any illicit substance use was defined as any past year use of cannabis, amphetamines, ecstasy/designer drugs and/or cocaine.

Outcome measures at 35 years (wave 10)

Social measures. Participants were assessed on the occurrence of the following binary measures:

1. ever separated from a long-term partner (>2 years) or divorced,
2. not currently in a relationship
3. not currently in paid full-time or part-time employment

4. in receipt of government welfare (as defined at wave 8).

We identified those who had multiple indicators of social difficulties as those with two or more indicators of the four social measures.

Mental health. The presence of *major depressive disorder* (MDD) and an *anxiety disorder* (which included generalised anxiety disorder, social phobia, agoraphobia or panic disorder) were determined using the Composite International Diagnostic Interview (CIDI) ¹⁴.

Smoking and alcohol consumption were assessed using the same measures as at age 24 years. Nicotine dependence was assessed using the Fagerstrom Test for Nicotine Dependence ¹⁵ and was defined at a cut-off point of >3. Alcohol abuse and dependence using DSM-IV criteria was assessed using the CIDI.

Cannabis use. Any cannabis use in the past year was identified.

Any other illicit substance use was defined as use in the past year of amphetamines, ecstasy/designer drugs and/or cocaine.

ANALYSIS

For PD we summarise who responded, and compared the measures collected at waves 8 for participants who were assessed for PD with those who were not assessed but participated at wave 8. We estimated the prevalence of covariates at age 24 years and 35 years, stratified by PD severity using observed data and within a multiple imputation framework (see below). Logistic regression models with robust standard errors were used to estimate the association between PD severity at wave 8 and (1) each of the other exposure measures at wave 8 and (2) each outcome measure at wave 10. For the wave 8 exposure models, we estimated the effects, of PD unadjusted, and then adjusted for gender and parental divorce/separation during adolescence. For the wave outcome 10 models, we fitted three models: unadjusted: adjusted for gender and parental divorce/separation during adolescence; and also adjusted for the social, mental health and substance use status at age 24 years. All model effects were assessed for

statistical significance using the Wald test (two-sided). PD severity was modelled using three dummy variables, with no PD or personality difficulty selected as the reference category. To assess if adverse outcomes varied across the PD severity categories, we jointly tested the dummy variables for statistical significance. In the partially and fully adjusted models, we found no statistical evidence for interactions between gender and PD severity.

There were generally low levels of missing data on individual measures at any given wave. However, reducing the analysis sample to participants who had completed both survey waves could result in potentially biased estimates. To address this, we used multiple imputation¹⁶. We imputed 50 complete datasets, separately for males and females, using multivariate imputation by chained equations¹⁷ incorporating all analysis and a selection of auxiliary variables, which were thought to be potentially associated with incomplete participation. Participants were included in the imputation if they had been seen at either wave 8 or wave 10 and had not died by wave 10. The imputation dataset contained 1635 individuals. The imputation model contained 23 key variables and 3 auxiliary variables (neuroticism at wave 7, age at wave 8 and home ownership at wave 10). Of these 26 variables, 12 variables had <10% missing values, 7 had 10-14% missing, 6 had 15-20% missing and 1 (PD severity) had 30% missing. We imputed neuroticism and age using linear regression and PD severity using ordinal logistic regression. All other variables were binary and were imputed using logistic regression. All estimates were obtained by averaging results across the fifty imputed datasets with inferences under multiple imputation obtained using Rubin's rules¹⁶. We performed a sensitivity analysis using available case data, which included all participants who had complete data for the background factors used in the analysis at wave 8 and at least one outcome measure (with >10% prevalence) at wave 10. We analysed data with Stata version 13¹⁸.

ROLE OF THE FUNDING SOURCE

The funder of the study had no role in study design or conduct, data collection, data management, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

RESULTS

Of the 1520 wave 8 participants, a total of 1145 (75%) informant interviews for PD were conducted. Three hundred and four participants (20%) refused to nominate a friend. In the case of 45 participants (3%), the informant refused or was non-contactable and in the case of 26 participants (2%), friends were located but did not agree to be interviewed. The majority of informants were female (n=891, 78%). Informants had known the participant for a median 10 years (inter-quartile range (IQR) 5-18), with a median of 12 contacts per month (IQR: 4-30). The informants were friends or partners (n=872, 76%), relations (n=253, 22%) or spouses (n=20, 2%). Compared to males, females were more likely to have been assessed for PD, with all other wave 8 background factors comparable between those who were and were not assessed for PD (Appendix Table 1).

Prevalence of personality difficulties, PD, background factors at 24 years of age and socio-demographic, mental health and substance use status at 35 years are displayed in Table 1. At age 24 years, 28% had either personality difficulties or PD: 7% (n=113) had some form of personality difficulty; 13% (n= 216) had a simple PD; 5% (n=86) had complex PD and 2% (n= 37) had severe PD.

Unadjusted and partially adjusted associations between severity of PD with mental health and social measures at 24 years are displayed in Table 2.

At age 24 years, severity of PD was significantly associated with the absence of post-school qualifications, the receipt of welfare, the presence of common mental disorders and daily

cigarette smoking. There was no evidence for an association between PD severity and either high-risk alcohol use or illicit substance use at age 24 years.

Table 3 displays the estimates of association between PD severity at age 24 years and social difficulties at age 35 years.

In unadjusted and partially adjusted models, PD severity at age 24 years was associated with not being in a relationship, receiving government welfare and the occurrence of multiple social difficulties at age 35 years. In fully adjusted models that accounted for possible confounding by prior mental health and social difficulties at age 24 years, these associations were attenuated, but remained significant, with the exception of the occurrence of multiple social difficulties ($p = 0.24$).

Prospective associations between PD severity and mental health and illicit substance use outcomes at age 35 years are displayed in Table 4. In fully adjusted models that accounted for prior mental health and social difficulties at age 24 years, there was evidence of an association between PD severity and later anxiety disorder, with increased odds of anxiety for those with personality difficulty (OR=2.43, 95% CI 1.30 - 4.53) and complex and severe PD (OR=2.27, 95% CI 1.20 - 4.28), and similar risk for those with simple PD (OR=1.52, 95% CI 0.88 - 2.64), relative to those with no PD or personality difficulty. A similar pattern of associations was found in the fully adjusted model of MDD with evidence of increased risk for those with personality difficulty (OR=2.14, 95% CI 1.15 - 3.99) and complex and severe PD (OR=2.23, 95% CI 1.24 - 4.01), relative to those with no PD, and no evidence of an increased risk for those with simple PD (OR=1.33, 95% CI 0.81 - 2.20). We found no evidence of an association between PD severity and later illicit substance use.

Prospective associations between PD severity and licit substance use and dependency at age 35 years are displayed in Table 5. In unadjusted and partially adjusted models, PD severity was associated with daily cigarette smoking, nicotine and alcohol dependence. In fully adjusted

models that accounted for the occurrence of substance use at age 24 years, these associations were substantially attenuated. A sensitivity analysis of the observed data showed similar findings, confirming the pattern of results obtained with imputed data (Appendix Tables 2-6).

DISCUSSION

In this large representative cohort, the presence of personality disorder in young adulthood was associated with significantly poorer mental health ten years later. These links were not explained by previous patterns of substance use or the occurrence of past mental health or social problems. At age 24 years, those with personality difficulties and disorder already differed markedly from those without such difficulties in terms of their social and health profile. A decade later, even after controlling for this baseline level of disadvantage in the mid-20s, those with personality difficulties and disorders went on to have worse outcomes in the key domains of relationships and future mental health. For individuals in both the ‘simple’ and ‘complex’ PD groups, we detected robust associations with not being in a relationship at age 35 years. This association was not mirrored by an increase in the odds of separation/divorce, suggesting that long-term relationships may not even have been formed, let alone broken down, during the follow-up period. These findings are consistent with clinical literature reporting that impairment in close social relationships is an enduring feature of PD¹⁹ and one which currently appears to be fairly resistant to psychological input²⁰. The long-term absence of a relationship and associated loneliness may of course result in considerable distress, but in addition, the absence of a relationship to buffer the effects of stress might itself be an important precursor for poor future health.

Individuals with personality difficulties and disorder were also at risk of developing anxiety and depression by age 35 years. The associations between severity of personality disorder and later depression and anxiety were partially attenuated by prior difficulties. Yet, importantly, in the fully adjusted models, these associations were not eliminated, suggesting that the presence

of personality pathology is an independent risk factor for future depression and anxiety. Further research is required to delineate the precise causal pathway between personality disorder and subsequent depression and anxiety.

In both the partial and fully adjusted models the odds of future depression and anxiety were of a similar magnitude for those with 'personality difficulty' and for those with 'complex and severe PD'. Although the odds ratios for associations with 'personality difficulty' were greater than they were for 'simple PD', the confidence intervals substantially overlapped and so those with personality difficulty may not have had definitively worse mental health outcomes compared to those with simple personality disorder. Notwithstanding, there is scant research on the association between sub-threshold symptoms of PD and later depression and anxiety^{21,22}. In principle, some individuals suffering from depression and anxiety could have been misclassified as having personality difficulties. Yet even when we controlled for the presence of common mental disorder at age 24 years, we detected a robust signal between the presence of personality difficulty and the odds of depression and anxiety at age 35 years. The presence of personality difficulties is not a formal diagnosis, yet such difficulties are commonly encountered in both general and clinical populations and their prognostic significance is unclear. Other research has identified elevated levels of maladaptive personality traits among adults who self-harm²³, as well as among young people who die by suicide²⁴ and so the occurrence of personality difficulties appears to flag key vulnerabilities. Our study has helped to further clarify this issue, by showing that the presence of personality difficulties is an independent risk factor for future depression and anxiety.

A more nuanced picture emerged with respect to the other outcomes. At age 24 years, those with personality difficulty or disorder were already smoking more heavily compared to those without personality difficulty or disorder. When we accounted for these baseline differences in smoking status in the regression model, the association between PD severity and smoking

status at age 35 years was substantially attenuated. From this we infer that although people with PD are at higher risk of smoking, their levels of smoking and nicotine dependence do not appear to worsen over time in comparison to those without PD who were young adult smokers. Similarly, after accounting for baseline differences in alcohol consumption at age 24 years, the association with alcohol dependence at age 35 years was substantially attenuated.

We found no statistical evidence for interactions between gender and PD severity in any of our models. This finding is consistent with research into the longer-term outcome of patients with Borderline Personality Disorder (BPD), showing that whilst education predicts better psychosocial functioning, gender appears to have little effect⁴. Beyond the field of BPD, there has been little investigation of the effects of gender and other key prognostic variables on the natural history of personality disorder and this area certainly warrants further exploration.

Our study has a number of strengths. We used a prospective, longitudinal design and obtained a large, representative sample with high retention over the 10-year follow-up period. Only one other population-based study (the Children in the Community (CIC) Study) has examined the influence of young adult PD on later mental health²⁵ and in contrast to our study, it did not use a structured interview to assess PD in emerging adulthood. In addition, we relied on different informants for the PD and outcome data, further increasing the internal validity of the study. We also reduced the likely effects of non-response bias by using multiple imputation.

The study also has limitations. Two hundred and ninety-three people did not participate in the PD assessment at wave 8 and participation bias may therefore have had an impact on our findings. Unmeasured confounding and reverse causality may have contributed to some of the detected associations. Whenever possible we used equivalent measures in waves 8 and 10. The measures of common mental disorder were however not identical at 24 and 35 years, and residual confounding of some associations by common mental disorder cannot be excluded. The use of an informant can improve the validity of a diagnostic assessment for PD²⁶, however,

as with self-description, informant reports can also introduce information bias. In addition, the concurrent validity of the SAP in establishing severity thresholds has not been previously examined. We did not adjust the models for place of residence. Whilst the location of school was recorded when participants were initially recruited into the study, residential location was not re-assessed at age 24 and we did not consider school location to be a reliable index of place of residence at age 24. Finally, we failed to capture the full range of mental disorder, as well as physical health problems and these would be important to study in future research.

In conclusion, we found that personality disorder was already linked with social disadvantage, and higher rates of mental and substance use disorders by the mid-20s. Over the next 10-year period, even after taking these differences into account, individuals with PD (as well as those with sub-threshold personality difficulties) had significantly worse mental health outcomes and poorer relational functioning. Our findings have implications for the scope of population-based studies of mental disorder. Currently PD is not included in global or national estimates of disease burden and future efforts designed to improve understanding of population mental health could be more successful if they took account of the effects of PD. The findings also have ramifications for prevention and early intervention. Personality disorders have their origins in childhood and adolescence and our data indicate that they are associated with widening social and health inequalities in the fourth decade of life. Early intervention programmes for BPD have yielded promising findings²⁷ and such programmes should be broadened to encompass the full range of personality disorder. Yet further investments are needed to evaluate innovative strategies which might address the substantial social and disease burdens experienced by individuals with PD.

AUTHORS CONTRIBUTIONS

GCP and PM conceived the original idea for the study which was also discussed with AC. PM GCP, AC and LD developed the analysis plan with CC and HR. CC and HR analysed the data. PM led the writing of the manuscript and all authors critically revised the manuscript. All authors have given their approval for the publication of this manuscript and agree to be accountable for all aspects of the work in ensuring that the questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. PM guarantees the paper and is the corresponding author.

DECLARATION OF INTERESTS

We declare no competing interests.

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Panel: Research in context

Evidence before this study

We sought to identify relevant studies that have examined prospective associations between personality disorder (PD) and future mental health and social adjustment, in a non-treatment seeking sample of adults. We searched MEDLINE and PsycINFO from inception and

EMBASE from 1974 using the following search terms: “personality disorders”, “personality disorder”, “longitudinal study”, “cohort study”, “community”, and “severity”, and only examined articles written in English. The McLean Study of Adult Development⁸ and the Collaborative Longitudinal Personality Disorders Study⁷ have reported a range of prospective outcomes in samples of treatment-seeking adults with selected personality disorders. Collectively these studies show that whilst symptomatic remission is common, impairment in social functioning is an enduring feature of some personality disorder subtypes^{4,28}. However, the generalisability of findings from these studies of clinical groups to the general population is unclear. One previous population-based study (the Children in the Community (CIC) Study)²⁵ has generated knowledge about the links between adolescent personality pathology and adult mental health outcomes^{22,29-31}. However, the CIC study did not use a structured interview to assess PD in emerging adulthood. To our knowledge, no published studies have reported on 1) the long-term outcomes of PD in a non-treatment seeking sample assessed for PD in emerging adulthood using a structured interview or 2) on the long-term outcomes of PD stratified by PD severity.

Added value of this study

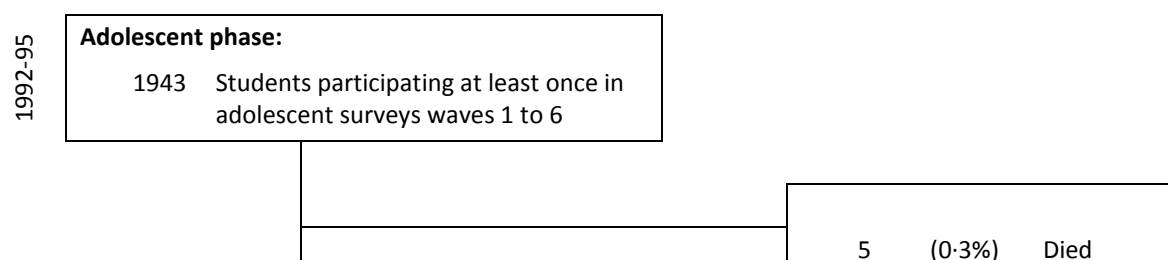
In this population-based, longitudinal study, we not only examined the influence of personality disorder on future mental health and social adjustment, but we also captured the impact of sub-threshold personality difficulties. Both personality difficulties and personality disorder were linked to the occurrence of mental health problems 10 years later, as well as the absence of a long-term relationship. These links were all maintained even after taking previous mental health and social problems into account.

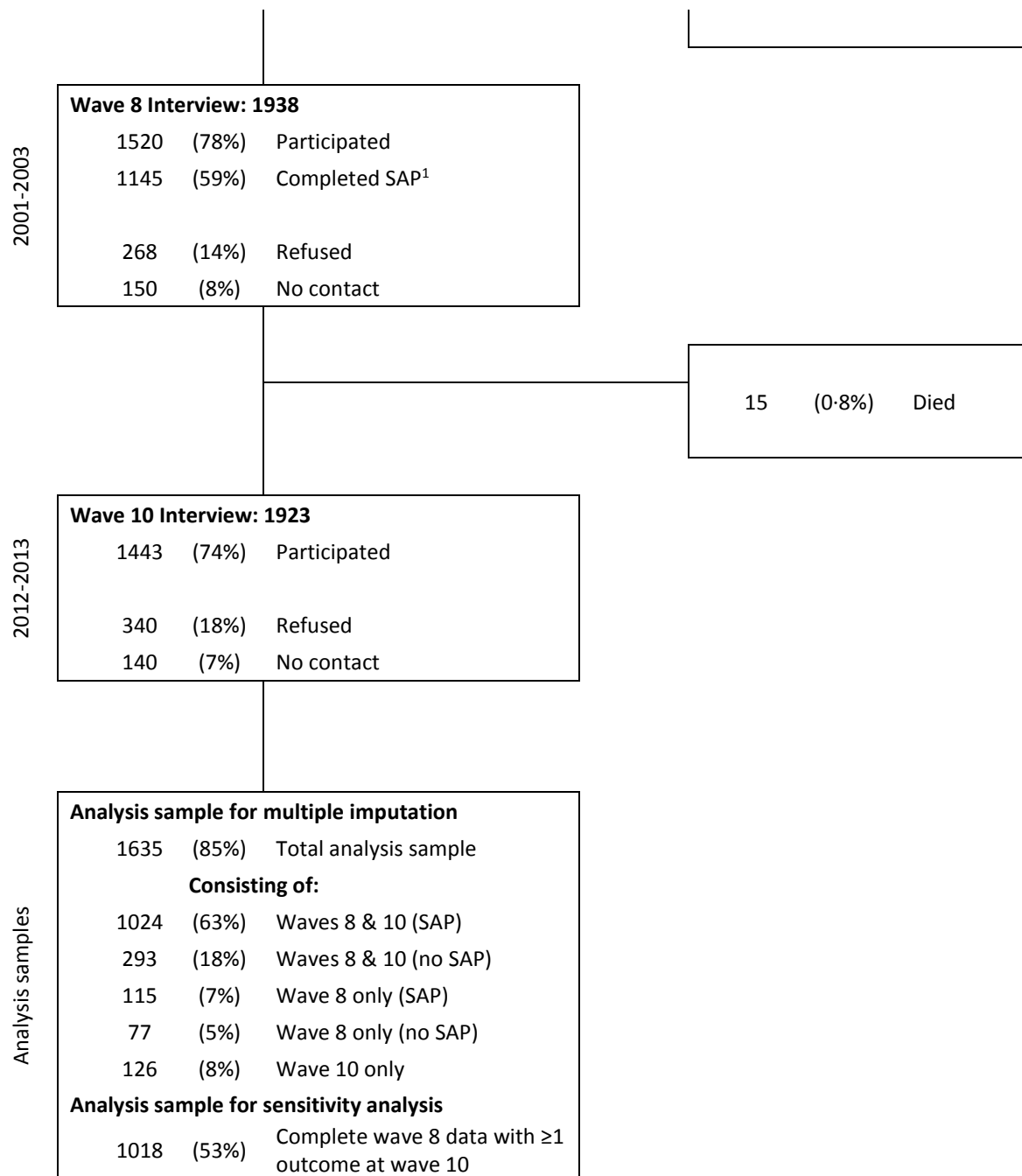
Implications of all the available evidence

Personality disorder is common in the general population and is associated with a distinct cross-sectional pattern of social and health-related disadvantage. Over time, even after taking these

baseline differences into account, individuals with personality disorder (as well as those with sub-threshold personality difficulties) have worse mental health and poorer relational outcomes. Our findings indicate that future efforts to understand population mental health could be more successful if they incorporated personality disorder into their assessment of disease burden. The findings also have implications for early intervention and prevention, suggesting the need for innovative strategies to address the substantial social and disease burdens experienced by individuals with PD.

Figure 1. Sampling and Ascertainment in the Victorian Adolescent Health Cohort, 1992 to 2013.





KEY: ¹SAP Standardised Assessment of Personality at wave 8

TABLE 1. Personality disorder (PD) and background factors at 24 years and outcomes at 35 years in the observed¹ and multiple imputed datasets

Measure	Observed data			Imputed data N=1635	
	N	n	(%)	n ²	(%)
At 24 years (wave 8)					
PD severity					
No PD or personality difficulty	1139	834	(73)	1182	(72)

Personality difficulty	1139	79	(7)	113	(7)
Simple PD	1139	148	(13)	216	(13)
Complex PD	1139	56	(5)	86	(5)
Severe PD	1139	22	(2)	37	(2)
Female	1635	882	(54)	882	(54)
Parental divorce/separation	1635	362	(22)	362	(22)
In receipt of government welfare	1509	118	(8)	133	(8)
No post-school qualifications	1508	525	(35)	575	(35)
Common mental disorder	1507	319	(21)	349	(21)
Substance use					
Daily cigarette smoking	1509	437	(29)	479	(29)
High risk alcohol use	1494	670	(45)	735	(45)
Any illicit substance use	1505	560	(37)	613	(38)
<u>At 35 years (wave 10)</u>					
Social measures					
Ever separated or divorced	1343	339	(25)	423	(26)
Not currently in a relationship	1441	284	(20)	333	(20)
Not currently in paid employment	1441	225	(16)	260	(16)
In receipt of government welfare	1430	93	(7)	119	(7)
Multiple social difficulties	1334	182	(14)	249	(15)
Mental health					
Anxiety disorder	1348	154	(11)	198	(12)
Major depressive disorder	1346	156	(12)	200	(12)
Licit substance use					
Daily cigarette smoking	1442	249	(17)	296	(18)
High risk alcohol use	1337	467	(35)	577	(35)
Licit substance dependence					
Nicotine dependence	1434	95	(7)	117	(7)
Alcohol dependence	1346	117	(9)	151	(9)
Illicit substance use					
Any cannabis use	1435	197	(14)	229	(14)
Any other illicit substance use	1429	150	(10)	174	(11)

¹ Observed dataset contained participants seen at wave 8 and/or wave 10 and excluding those who had died by wave 10

² Frequency estimates were calculated with imputed percentage estimate and total number of participants for all measures except those with no missing data

TABLE 2 Estimated associations between severity of personality disorder (PD) at 24 years and social difficulties and mental health at 24 years¹

PD severity at 24 years (wave 8)	Social difficulties at 24 years (wave 8)				Mental health at 24 years (wave 8)	
	No post-school qualifications		Receipt of welfare		Common mental disorders	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
UNADJUSTED						
No PD or personality difficulty	1		1		1	
Personality difficulty	1.04	(0.64 - 1.69)	1.41	(0.63 - 3.15)	1.75	(1.07 - 2.84)
Simple PD	1.51	(1.08 - 2.11)	2.35	(1.36 - 4.07)	1.89	(1.31 - 2.73)
Complex & severe PD	1.91	(1.22 - 2.98)	2.77	(1.47 - 5.24)	1.81	(1.10 - 2.98)
Joint p-value	0.006		0.0001		0.0006	
PARTIALLY ADJUSTED¹						
No PD or personality difficulty	1		1		1	
Personality difficulty	1.03	(0.63 - 1.67)	1.33	(0.59 - 3.02)	1.67	(1.01 - 2.75)
Simple PD	1.49	(1.06 - 2.09)	2.25	(1.29 - 3.92)	1.82	(1.25 - 2.66)
Complex & severe PD	1.76	(1.11 - 2.76)	2.52	(1.33 - 4.78)	1.77	(1.08 - 2.90)
Joint p-value	0.02		0.004		0.002	

¹ Multiple imputation was used to handle missing data in this analysis

²adjusted for gender and parental divorce/separation during adolescence

TABLE 2 (continued) Estimated associations between severity of personality disorder (PD) at 24 years and licit and illicit substance use at 24 years¹

PD severity at 24 years (wave 8)	Licit and illicit substance use at 24 years (wave 8)					
	Daily cigarette smoking		High risk alcohol use		Any illicit substance use	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
UNADJUSTED						
No PD or personality difficulty	1		1		1	
Personality difficulty	1.63	(1.03 - 2.59)	0.95	(0.61 - 1.47)	1.11	(0.69 - 1.79)
Simple PD	1.54	(1.07 - 2.23)	0.90	(0.64 - 1.27)	1.39	(0.99 - 1.96)
Complex & severe PD	2.18	(1.40 - 3.39)	0.94	(0.59 - 1.50)	1.44	(0.92 - 2.25)
Joint p-value	0.0005		0.94		0.14	
PARTIALLY ADJUSTED¹						
No PD or personality difficulty	1		1		1	
Personality difficulty	1.59	(1.00 - 2.54)	0.99	(0.63 - 1.56)	1.12	(0.69 - 1.80)
Simple PD	1.50	(1.04 - 2.17)	0.93	(0.65 - 1.32)	1.40	(0.99 - 1.98)
Complex & severe PD	2.01	(1.29 - 3.14)	0.88	(0.55 - 1.43)	1.32	(0.83 - 2.10)
Joint p-value	0.002		0.94		0.23	

¹ Multiple imputation was used to handle missing data in this analysis

²adjusted for gender and parental divorce/separation during adolescence

TABLE 3 Estimated associations between severity of personality disorder (PD) at 24 years and social difficulties at 35 years¹

PD severity at 24 years (wave 8)	Social difficulties at 35 years (wave 10)					
	Ever separated/divorced		Not in a relationship		Not earning money	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
UNADJUSTED						
No PD or personality difficulty	1		1		1	
Personality difficulty	1.26	(0.75 - 2.14)	1.16	(0.62 - 2.16)	1.16	(0.63 - 2.13)
Simple PD	1.41	(0.94 - 2.12)	2.07	(1.36 - 3.16)	1.16	(0.72 - 1.88)
Complex & severe PD	1.97	(1.19 - 3.25)	2.50	(1.52 - 4.13)	1.32	(0.71 - 2.44)
Joint p-value	0.03		0.0001		0.76	
PARTIALLY ADJUSTED²						
No PD or personality difficulty	1		1		1	
Personality difficulty	1.20	(0.70 - 2.06)	1.15	(0.61 - 2.15)	1.10	(0.58 - 2.07)
Simple PD	1.34	(0.89 - 2.02)	2.06	(1.35 - 3.14)	1.11	(0.67 - 1.85)
Complex & severe PD	1.77	(1.06 - 2.96)	2.36	(1.43 - 3.88)	1.38	(0.70 - 2.70)
Joint p-value	0.09		0.0002		0.78	
FULLY ADJUSTED³						
No PD or personality difficulty	1		1		1	
Personality difficulty	1.10	(0.63 - 1.91)	1.09	(0.57 - 2.08)	1.07	(0.57 - 2.03)
Simple PD	1.16	(0.75 - 1.80)	1.83	(1.18 - 2.83)	1.01	(0.60 - 1.70)
Complex & severe PD	1.50	(0.88 - 2.55)	2.05	(1.21 - 3.45)	1.19	(0.59 - 2.40)
Joint p-value	0.46		0.006		0.96	

¹ Multiple imputation was used to handle missing data in this analysis² adjusted for gender and parental divorce/separation during adolescence³ adjusted for gender and parental divorce/separation during adolescence, and at wave 8: no post-school qualifications, in receipt of government welfare, common mental disorders, daily cigarette smoking, high risk alcohol use, and any illicit substance use

TABLE 3 (continued) Estimated associations between severity of personality disorder (PD) at 24 years and social difficulties at 35 years¹

PD severity at 24 years (wave 8)	Social difficulties at 35 years (wave 10)			
	Receipt of welfare		Multiple social difficulties	
	OR	(95% CI)	OR	(95% CI)
UNADJUSTED				
No PD or personality difficulty	1		1	
Personality difficulty	2.48	(1.17 - 5.26)	1.51	(0.81 - 2.81)
Simple PD	2.44	(1.39 - 4.28)	1.88	(1.20 - 2.95)
Complex & severe PD	2.83	(1.32 - 6.07)	2.38	(1.33 - 4.26)
Joint p-value	0.001		0.002	
PARTIALLY ADJUSTED²				
No PD or personality difficulty	1		1	
Personality difficulty	2.38	(1.12 - 5.06)	1.43	(0.76 - 2.71)
Simple PD	2.34	(1.32 - 4.14)	1.80	(1.15 - 2.83)
Complex & severe PD	2.55	(1.18 - 5.51)	2.18	(1.21 - 3.93)
Joint p-value	0.004		0.008	
FULLY ADJUSTED³				
No PD or personality difficulty	1		1	
Personality difficulty	2.30	(1.06 - 5.01)	1.32	(0.69 - 2.51)
Simple PD	1.89	(1.03 - 3.45)	1.46	(0.90 - 2.37)
Complex & severe PD	1.85	(0.83 - 4.16)	1.64	(0.86 - 3.12)
Joint p-value	0.06		0.24	

¹ Multiple imputation was used to handle missing data in this analysis² adjusted for gender and parental divorce/separation during adolescence³ adjusted for gender and parental divorce/separation during adolescence, and at wave 8: no post-school qualifications, in receipt of government welfare, common mental disorders, daily cigarette smoking, high risk alcohol use, and any illicit substance use

TABLE 4 Estimated associations between severity of personality disorder (PD) at 24 years and mental health and illicit drug use at 35 years¹

PD severity at 24 years (wave 8)	Mental health at 35 years (wave 10)				Illicit substance use at 35 years (wave 10)			
	Anxiety disorder		Major depression disorder		Any cannabis use		Any other illicit substance use	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
UNADJUSTED								
No PD or personality difficulty	1		1		1		1	
Personality difficulty	2.73	(1.52 - 4.93)	2.34	(1.28 - 4.28)	1.11	(0.58 - 2.13)	0.67	(0.27 - 1.66)
Simple PD	1.94	(1.15 - 3.27)	1.64	(1.01 - 2.65)	1.65	(1.06 - 2.58)	1.51	(0.92 - 2.50)
Complex & severe PD	3.01	(1.66 - 5.46)	2.83	(1.60 - 5.00)	1.68	(0.93 - 3.03)	1.86	(1.01 - 3.46)
Joint p-value	<0.0001		0.0002		0.08		0.07	
PARTIALLY ADJUSTED²								
No PD or personality difficulty	1		1		1		1	
Personality difficulty	2.59	(1.41 - 4.76)	2.28	(1.24 - 4.19)	1.10	(0.57 - 2.13)	0.67	(0.27 - 1.68)
Simple PD	1.83	(1.08 - 3.10)	1.59	(0.98 - 2.58)	1.65	(1.04 - 2.60)	1.54	(0.92 - 2.58)
Complex & severe PD	2.75	(1.50 - 5.04)	2.69	(1.52 - 4.79)	1.42	(0.78 - 2.59)	1.67	(0.87 - 3.20)
Joint p-value	0.0003		0.0005		0.16		0.13	
FULLY ADJUSTED³								
No PD or personality difficulty	1		1		1		1	
Personality difficulty	2.43	(1.30 - 4.53)	2.14	(1.15 - 3.99)	0.98	(0.45 - 2.11)	0.62	(0.23 - 1.62)
Simple PD	1.52	(0.88 - 2.64)	1.33	(0.81 - 2.20)	1.36	(0.81 - 2.30)	1.37	(0.78 - 2.43)
Complex & severe PD	2.27	(1.20 - 4.28)	2.23	(1.24 - 4.01)	1.18	(0.59 - 2.34)	1.60	(0.74 - 3.44)
Joint p-value	0.007		0.009		0.70		0.29	

¹ Multiple imputation was used to handle missing data in this analysis² adjusted for gender and parental divorce/separation during adolescence³ adjusted for gender and parental divorce/separation during adolescence, and at wave 8: no post-school qualifications, in receipt of government welfare, common mental disorders, daily cigarette smoking, high risk alcohol use, and any illicit substance use

TABLE 5 Estimated associations between severity of personality disorder (PD) at 24 years and licit substance use and dependency at 35 years¹

PD severity at 24 years (wave 8)	Licit substance use and dependency at 35 years (wave 10)							
	Daily cigarette smoker		High risk alcohol use in last week		Nicotine dependence		Alcohol dependence	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
UNADJUSTED								
No PD or personality difficulty	1		1		1		1	
Personality difficulty	1.60	(0.88 - 2.90)	0.86	(0.51 - 1.43)	2.24	(1.04 - 4.83)	0.99	(0.38 - 2.53)
Simple PD	2.01	(1.28 - 3.16)	1.05	(0.72 - 1.53)	1.75	(0.86 - 3.56)	1.33	(0.72 - 2.48)
Complex & severe PD	2.81	(1.69 - 4.68)	1.19	(0.71 - 1.99)	3.91	(1.92 - 7.97)	2.89	(1.52 - 5.50)
Joint p-value	<0.0001		0.81		0.0005		0.01	
PARTIALLY ADJUSTED²								
No PD or personality difficulty	1		1		1		1	
Personality difficulty	1.58	(0.85 - 2.91)	0.87	(0.51 - 1.48)	2.19	(0.99 - 4.82)	0.99	(0.38 - 2.58)
Simple PD	1.98	(1.25 - 3.14)	1.08	(0.73 - 1.59)	1.69	(0.82 - 3.47)	1.33	(0.71 - 2.49)
Complex & severe PD	2.53	(1.50 - 4.25)	1.05	(0.63 - 1.77)	3.35	(1.59 - 7.04)	2.56	(1.33 - 4.96)
Joint p-value	0.0004		0.92		0.004		0.03	
FULLY ADJUSTED³								
No PD or personality difficulty	1		1		1		1	
Personality difficulty	1.32	(0.64 - 2.74)	0.84	(0.48 - 1.49)	1.83	(0.74 - 4.54)	0.89	(0.33 - 2.43)
Simple PD	1.60	(0.91 - 2.81)	1.08	(0.71 - 1.65)	1.07	(0.47 - 2.42)	1.11	(0.59 - 2.10)
Complex & severe PD	1.81	(0.97 - 3.40)	1.07	(0.61 - 1.87)	2.12	(0.84 - 5.35)	2.29	(1.14 - 4.61)
Joint p-value	0.14		0.91		0.25		0.11	

¹ Multiple imputation was used to handle missing data in this analysis² adjusted for gender and parental divorce/separation during adolescence³ adjusted for sex and parental divorce/separation during adolescence, and at wave 8: no post-school qualifications, in receipt of government welfare, common mental disorders, daily cigarette smoking, high risk alcohol use, and any illicit substance use

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